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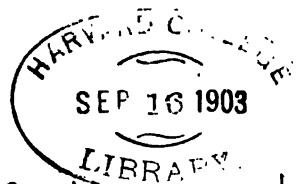
A SKETCHY REPORT
OF THE
PETROLEUM INDUSTRY AT BAKU

May 1886



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A SKETCHY REPORT
OF THE
PETROLEUM INDUSTRY AT BAKU

May 1886.

The Petroleum Wells of Baku, some 400 in number, are situated at Balakhani at an elevation of about 175 feet above the Caspian and about 8 miles from the Black Town, where the work of distilling and purifying is carried on. Outline history of the growth of production of the crude oil.

In 1801 the Petroleum Industry was farmed out as a monopoly to Meerzoeff, which system of working continued until 1872, and from then until September 1st, 1877, there was an excise duty, but from 1877, the trade has been free from all Government taxes, both as regards the work of obtaining the Crude Oil and also the work of extracting the Kerosine (Lamp Oil) and other products, but the Government prohibit the exportation of the Crude Oil, in order to encourage labour in the manufacture of Kerosine in the country, but I found at Batoum the exporters were mixing the Kerosine with "*distillate*" (unpurified Kerosine) in order to pass it into those Countries which tax heavily the importation of Kerosine, in which case it will have to again undergo the work of being purified.

Prior to 1821, I could find no record as regards the revenue this system of monopoly brought to the Government, but from 1821, to 1872 it yielded 5.203.178 roubles, giving an average yearly revenue of 100.000 roubles or Lst. 10.000

Prior to 1832, I could obtain no reliable data regarding the quantity of production of the Crude Oil, but in the year 1832, the production was 150.000 poods (2.500 tons) and in 1834, it increased to 230.000 poods (4.000 tons) and this yearly quantity of production was but little increased up to 1849. In 1863 the production was 340.000 poods (6.000 tons) and increased to 1.535.981 poods (25.600 tons) in 1872.

From 1872, to September 1st 1877, the excise duty brought to the Government 1.245.954 roubles (Lst. 124.595) and during this period, the increase of production was as follows :

1872	Monopoly	no excise duty	..	1.535.981 poods (25.600 t.)	
1873	no monopoly	but excise duty	3.951.575	»	
1874	»	»	»	»	4.862.643
1875	»	»	»	»	5.809.043
1876	»	»	»	»	11.000.000
1877	»	»	»	»	15.000.000 (250.000 t.)

so that during the 5 years the period the monopoly was abolished and the excise duty established, the growth of production increased ten times, whereas during the period of monopoly, it has taken 40 years to obtain the same ratio of increase.

Also during the period of 1872 and 1877 the Government sold the land as follows :

Crown	{	170 dessotines (459 acres)	for	2.980.000 r. (Lst. 298.000)
Lands	{	100	»	(270 ») granted to officials.
Private	{	175	»	(472 ») (for 2.028.000 roubles
Lands	{			(Lst. 202.800).

so that between 1872 and 1877 the Government obtained : —

Lst. 124.595 Excise duty

Lst. 500.800 Lands sold

Lst. 625.395

and add to this Lst. 520.317 received during the monopoly from

1832 to 1872 giving a total of Lst. 1.145.712 received by the Government from the Petroleum Industry from 1832.

Now from September 1st, 1877, the date at which all taxes were abolished and the trade made free, the increase of production has been as follows:

1877	free from tax from Sept. 1 st	15.000.000 poods (250.000 t.)	
1878	free from all tax	20.000.000	»
1879	» » » »	23.000.000	»
1880	» » » »	25.000.000	»
1881	» » » »	30.000.000	»
1882	» » » »	50.000.000	»
1883	» » » »	60.000.000	»
1884	» » » »	89.000.000	»
1885	» » » »	100.000.000	» (1.700.000t)

Average Specific gravity 875, so that during 8 years there was no monopoly or excise duty, the production increased about seven times.

The average cost of Crude Oil at the well since 1873, is as follows :

1873.	5	koupecks a pood	or	6/-	a ton
1874.	4	»	»	4/9	»
1875.	10	»	»	12/-	»
1876.	5	»	»	6/-	»
1877.	8	»	»	9/6	»
1878.	7	»	»	8/5	»
1879.	5	»	»	6/-	»
1880.	3	»	»	3/7	»
1881.	2	»	»	2/4	»
1882.	2	»	»	2/4	»
1883.	2	»	»	2/4	»
1884.	3 1/2	»	»	4/2	»
1885.	4	»	»	4/9	»

At the present time the production of Crude Oil exceeds the demand, and ready money will obtain it for 1 koupeck a pood, or $\frac{1}{2}$ a ton, but at such a price the drillers cannot make a livelihood but at 2 and upwards they make money.

The foregoing statements show that the production of Crude Oil greatly increased after the abolition of the monopoly, and to a still greater extent when the trade was entirely free from taxes, but they are now met with the difficulty of over production, and with the number of the small producers of so many different nationalities, it seems they cannot agree upon any scale to regulate the production to the demand, in proportion to the producing power of the different producers, and so keep the Crude Oil to a price that pays for the labour of procuring it. With a more easy transport to the Black Sea, the demand would increase to a great extent, and for a time, would remove the present difficulty of over-production, but the difficulties of transport over such a mountainous country must always be great.

Number and
depth of wells
etc.

In the year 1885 there were about 400 drilled wells with an average depth of about 500 feet and average diameter of 12 » Some calculate that the average level of the oil is lowered about 55 feet for every 500.000.000 gallons extracted, but this is difficult to realize as adjoining wells vary in depth from 200 to 600 feet and, although you may sink a well close to a flowing one of say 200 feet, you may not find oil until reaching a depth of between 4 and 500 feet, which rather argues that the oil is lodged in cells, but certain it is that the average depth of the wells is yearly increasing, for, in the year 1872, there were but two drilled wells and four hundred and fifteen pit wells and in 1873, the average depth was 154 feet

» 1880,	»	»	»	» 273 »
» 1882,	»	»	»	» 350 »

Nobles' N° 18 well, gave 1.125.000 gallons in 24 hours, and the Droogba was uncontrollable for four months, during which time

it was estimated that between 68 and 136 millions gallons were discharged, and under such conditions, it is estimated that the pressure of oil is about 200lbs. on the square inch. A good pumping well should yield between 18.000 to 22.000 gallons per day of 10 hours with a pump or bailor holding 45 gallons.

There are three different systems of drilling at Baku : the rope, ^{Drilling} the rod, and the water system.

The rope system seems to be the one that is likely to be adopted in future work. The only essential difference between this and the rod system, is that the rod (which is substituted for the rope) is in length of about 30 feet, and each time the boring bit has to be lifted in order to remove the borings by aid of the pump or bailor, the different lengths of iron have to be unscrewed, which occupies much more time than is occupied in lifting the borer with the rope system, which runs over the derrick pulley wheel and lifted by a «Crab».

The water system is used more for drilling test wells of small diameter, the principle being that a gas pipe takes the place of the rope or rod through which water is forced, and as it leaves the bottom just above the drill through small holes, it mixes up the borings, and forces it up outside the gas pipe, and reaches the surface in the form of muddy water. With this system the borer is only raised to be sharpened, but the well pipe will be of not more than 8" diameter to commence, reduced to a 6" and less, whereas with the rope and rod systems, the start is made with a 16" and sometimes an 18" and 20", and finishes with an 8", 10", 12" or 14" according to the difficulties met with in boring the well.

During the time the well is flowing, a small pipe will serve, but when the flow stops, and the oil has to be raised by a pump or bailor, anything less than an 8" pipe will allow but a small quantity of oil being raised each time the pump or bailor is lowered and raised.

The plant of a well consists of a derrick between 60 and 70 feet ^{Plant of a well.} high placed directly over the well, with two pulley wheels at the top the one for lifting the 1 1/4 ton boring bit to take 2 1/8 diameter rope, and the other for lifting the pump or bailor to take 1 1/4 diameter

rope. These two ropes are worked by separate «Crabs» with strong brakes. Then there is the working beam for giving the movement to the boring bit, and this, together with the two crabs, are worked by a stationary engine. If the wells are well grouped, one engine of more power might work many, but I doubt whether it would be advisable.

Formation
of ground and
cost of drill-
ing.

The formation of the ground at the Baku Wells is of a soft nature but the few Americans who are boring there, are of opinion it requires more care than the stone boring of Pennsylvania, as the bit is apt to run out of truth. They said it was possible to get through 36 feet in 24 hours, but I am of opinion 7 feet a day of 10 hours is a fair average for a 16" diameter boring and Lst. 1 a foot about the cost, in case the engine and derrick are found, and the sinker has only to provide rope and tools. The average cost of drilling a well of 700 feet in similar ground to that of Baku would be about Lst. 2.000.

System of
collecting the
oil.

The oil in leaving the wells either in the case of a flowing or pumping well, is collected in a reservoir adjacent to the well, formed by the excavation from the well, and from here it is pumped by small pumps into a central iron tank, and then pumped down to the refineries at Black Town through 6", 5", or 4" wrought-iron pipes. It should not stand in these open reservoirs longer than necessary, as gases etc. are given off during exposure.

System of
leasing the
land to sin-
kers.

The land at the Wells is owned by many, and the large producers such as Nobles, arrange to sink wells by giving the proprietor $\frac{1}{2}$ koupeck a pood or 7 pence a ton for all the oil raised, and the half dozen Americans who have lately started without capital have obtained a lease of the land, on the condition that the proprietor obtains $\frac{1}{3}$ of the oil raised, and considering the present value of the crude oil, these terms are as advantageous to the sinker as the $\frac{1}{2}$ koupeck a pood or 7 pence ton is to Nobles.

Outline history and
growth of produc-
tion of Kerosine.

At the Black Town, the Crude Oil is distilled and purified, and up to the present, they make little else than Kerosine and lubricating oils. Nobles, as an experiment, convert some of it into gas for working the shop engine, with a view to see whether it will be

economical for the engines working the boring machinery, for the water is so bad that their steamers bring fresh water from the Volga on the return trip.

In the year 1859, there was but one refinery, and the growth has been as follows :

1859	1
1861	2
1870	45
1879	195
1885	130

and the export of Kerosine from Baku from 1865 has been as follows:

1865	100.000 poods (1.666 tons)
1870	300.000 »
1871	380.000 »
1872	400.000 »
1873	832.800 »
1874	1.336.675 «
1875	1.990.041 »
1876	3.235.233 »
1877	4.594.766 »
1878	6.255.911 »
1879	6.963.658 »
1880	7.858.750 »
1881	11.634.285 »
1882	12.471.715 »
1883	14.252.625 »
1884	23.000.000 »
1885	27.000.000 » (450.000 tons)

In the year 1876, Nobles produced 6.200 poods (120 tons) and increased this production as follows :

1876	6.200 poods (120 tons)
1877	155.000 »
1878	278.000 »
1879	552.000 »
1880	1.725.000 »
1881	3.040.000 »
1882	4.506.000 »
1883	6.460.000 »
1884	9.500.000 »
1885	10.700.000 » (180.000 tons)

Present price
of Kerosine
and difficulty
of over pro-
duction.

At the present time price of Kerosine at Baku is about 12 kou-pecks a pood or say 14/- a ton; this is a price that will hardly pay a firm like Nobles; who have sunk such a large capital in bringing their Works and transport systems to such a state of perfection, but the many small producers, who have a most inexpensive plant, no skilled labour, and live themselves most inexpensively, can make a fair living at such a price, and even produce it at 2 koupecks a pood less than Nobles. Here again it has been tried to regulate the production to the demand, in proportion to the producing power of the different producers, and so keep the price at such a figure that will give the producers a fair profit, but the number of small distillers oppose such an arrangement, seeing that it is more advantageous to the large producer than to themselves, and they no doubt see that even at a very great sacrifice, a firm such as Nobles could not drive them out of the trade, for, were the price run down to a figure at which they could not produce it at a profit, it would only be a matter of suspending a few workmen earning 25/- a month; whereas it would be almost out of the question stopping so gigantic a system as Nobles' with its steamers, Tank Cars and reservoir system throughout Russia, and when they would again have to raise the

price to such a figure that left a profit, the small people would again start without feeling but little the effect of the stop, and again undersell the larger producer.

The Government have now decided that the future flashing point of Kerosine is not to be less than 28° Reaumur or 95° Fahrenheit (instead of 25° R.) with a strict supervision. Future flashing point of Kerosine government supervision.

This no doubt will be greatly in favour of the large producer, as a given quantity of Crude Oil will give off a much less quantity of Kerosine at 28° than at 25°, and again the small producers have, no doubt, been producing and selling Kerosine at a much lower flashing point than even 25°: whereas Nobles have probably exceeded it, and the new standard of 28° R. will make little or no difference to a firm such as Nobles, whose system is continuous distillation.

In the year 1885, Nobles turned out 180.000 tons of Kerosine, or at the rate of 500 tons a day, and the manager Mr Gustavus Tornudd told me they are able to turn out Kerosine at the rate of 1.000 tons a day, which would give a yearly produce of not very much less than the whole produce of Baku for 1885.

Although there were 65 more refineries in 1879, than in 1885., my opinion is that the large firm did not thoroughly foresee the difficulty of commanding the trade, where so many small Tartars are proprietors, and they were also a little short-sighted in not seeing their way to a practical outlet for their produce to the Black Sea, before entering upon so gigantic a scale of production, for the Railway freight of 16 Koupecks a pood or nearly Lst. 1 a ton from Baku to Batoum; more than doubles the price of the Kerosine, and the quantity they can pass over the Railway is limited at present.

There are two systems of distilling: the Continuous system used by Nobles, and the non-Continuous system used by the other distillers, the essential difference between the two being that in the one case the supply of Crude Oil and the «stills» is so arranged that the Oil gravitates through the stills and leaves the last still in the form of Astalki, each still giving off gases of different densities, according to the temperature of the oil in the different stills, varying from Distilling.

say 100 Reaumur (258° Fahrenheit) to 300 R. (709° Fah) for between these temperatures all gases are given off, whose specific gravities are as light or lighter than Kerosine (Lamp Oil) whereas, in the ordinary system, the stills are independent of each other, and when filled with the Crude Oil, they are each gradually heated up to the temperature of say 300 R. at which point the Astalki is run off and the stills refilled and so on.

The Continuous system is certainly the correct one in theory, but it can only be used with economy with a large producer, and when the oil is of such a nature that in the form of Astalki it is not too stiff to flow freely, which is the case with the Baku Oil.

Description
and arrange-
ment of plant.

The more detail description of the Continuous distilling of Kerosine is as follows :

The ground on which the distilling and purifying is to be carried out, should be on the slope, or else the tanks for holding the Crude Oil. must be so elevated as to allow the oil to gravitate through the stills and the distillate to then gravitate to the test house, and if the nature of the ground further permits, the distillate should further gravitate through the Purifying Tank and on the Storage tanks, which tanks should be at such an elevation as will feed by gravitation the Steamers or tank Cars.

In case the nature of the ground will not wholly permit of such a complete system of gravitation, then the distillate would have to be pumped up to an elevation that would permit of its passing through the three sets of Purifiers, and then the Kerosine would likely have to be again pumped up to the storage tanks; of course the less pumping the less outlay in machinery.

The continuous system of stills should consist of about 20 stills of say 20 feet by 10 feet diameter with a «britches flue» free at one end for free expansion.

The stills should be placed on the incline, to allow the Oil to gravitate through them. The first still would be fed by a pipe of about 6" diameter direct from the storage tank of Crude Oil and carried direct to the bottom far end of the first still.

This 6" pipe from the Storage tank runs in front of the whole length of the stills with three check valves to each still, so that any of the stills can be placed under repairs without interfering with the rest. The oil leaves the stills through a pipe at the same level as it enters and gravitates on to the next one, undergoing exactly the same process as it did in passing through the first and so on to the last still, by which time the whole of the light gases down to the solar oil should have been evaporated, and what remains is called Astatki.

Just above the bottom of the stills, three perforated pipes are laid with the holes pointing downwards, through which steam is passed, in order to agitate the oil and save the bottom of the stills from burning. The gases leave the stills from a centre dome and conical-shaped pipe tapering to take a 6" pipe, and here it passes through several coils of piping surrounded by water, which will be gradually reduced in diameter as it reaches the bottom of the Condenser box, finishing at the bottom with a 2" gas pipe; this gas pipe runs direct to the test house. Every still has its Condenser and gas pipe carrying the distillate direct to the test house, so that a set of 20 stills will have 20 pipes leading direct to the test house. The amount of surface of condensing pipes will be about 800 square feet for the first still, gradually increasing to about 1,200 square feet for the last still.

The Condensing water gravitates through all the Condensers in the same way the oil gravitates through the stills, leaving by the top and carried by a wooden pipe to the bottom of the next one and so on.

The first Condenser is fed by about a 6" pipe, but in case a greater degree of cold may be required in any of the Condensers, a 6" pipe is also carried along the top of the Condenser with a valve leading to each, so that the temperature of the water may be adjusted in any Condenser, in case the Condensing surface or heat of water of any Condenser requires adjustment; this is regulated by the man in charge of the test house who is continually testing the oil or distillate as it leaves the pipes from the Condensers, and in case of defects, he speaks through his tube to the man in charge of the stills and the defects are remedied.

As a fire precaution, in case of fire caused through the breaking of a pipe, it is necessary that all pipes are laid in a channel that can be sluiced with a quantity of water, and so convey the flame to an underground sluice valve which smothers it.

In case of the accumulation of too much pressure in the stills, each pipe leading from the still is fitted with a safety-valve and the oil pipe connecting the stills is covered with some non-conducting material. The pipes running from the stills to the test house, are laid in an incline trough, so that in case of a broken pipe igniting, a large quantity of water can be passed over the pipes and carry the flame to a smothering valve.

The sea water is used for condensing and all cooling purposes.

Test House.

The distillate in reaching the test house is run into a tank with several divisions, and into one other of these the man in charge runs the distillate, separating the too light-Benzine and Gasoline, and the too heavy solar oils from the Kerosine. He is continually testing the distillate from the different pipes and notes down the specific gravity on a tabulated board for the purpose. Little is done with the Benzine or Gasoline, but the solar oil is returned to the Astalki and burnt. Some of the Kerosine distillate has a poor colour, in which case it has to be redistilled. From the test house the Kerosine distillate (in Nobles' Works) runs into underground tanks and is pumped into the first Purifier, which stands on an elevated position. In this vessel the distillate is mixed with sulphuric acid in about the proportion of $\frac{1}{4}$ per cent. This iron tank is lined with sheet lead and fitted at the top with a few perforated lead pipes to distribute the sulphuric acid over the surface, and at the bottom, larger lead pipes are fitted, through which a strong blast of air is passed, in order to agitate and thoroughly mix together, the distillate and sulphuric acid. This tank has a graduated scale fixed on the outside, and when the tank contains the required quantity, a sample of it is taken to the Chemist, who determines the quantity of Sulphuric Acid required, which is forced in from a vessel (lined with sheet lead) by compressed air. When this quantity of distillate and sulphuric acid

is thoroughly mixed up together, it is allowed to stand and settle, when it is again tested by the Chemist, and if found satisfactory, it is run off into corresponding-sized iron vessel, but without lead lining, and mixed with about $\frac{1}{2}$ per cent of Caustic Soda to neutralize the acid, which proportion is also regulated by the Chemist, and when the two are thoroughly mixed together by the compressed-air, and allowed to settle, the Kerosine is tested, and if found correct it is run off and pumped into the Storage tanks, or should the «flashing point» be too low, it is then run into vessels and heated by a steam passing through pipes, and the gases allowed to escape until the proper flashing point has been arrived at, and then it is pumped up to the Storage tanks, from which point the tank Steamers and Railway Cars are fed. Another point of some importance that Nobles are doing, is, to cool the Astatki by the Crude Oil instead of by water, so that he gets his oil at a temperature of about 100 R. at the time it passes into the first «still» but this arrangement has been an after thought, and at present the hot oil has to be pumped up to the level of the stills. Were the scheme properly arranged, no doubt the oil might be made to gravitate from the tank containing the Crude Oil through the condenser for cooling the Astatki and back to a rather less elevation. This may likely be adopted by Nobles before very long.

The plant and arrangement for extracting the lubricating oil from the Astatki is the same as is used for extracting the Kerosine from the Crude Oil, with the exception that a dyer or superheated steam is required to agitate the Astatki in the stills, and a greater furnace heat required, giving a temperature from about 300 R. to 400 R. in the stills, but the purifying requires more attention and is more expensive.

As a fuel the Naptha residue, refuse or Astatki (as it is called at Baku) has great advantages, and can be used as a substitute for coal in almost all cases, such as the steaming of boilers, working of smith forges, rivet forges, and even for the smelting of iron and brass. It certainly has advantages over coal in storage and transport generally

and where it can be obtained at about the same price, I am of opinion it is a better and more economical fuel, and with a good burner and little practice, would probably effect a great saving over coal at the same price, supposing it is of a similar nature to what I have seen at Baku.

I am of opinion it is especially adopted to steamers, and more especially so in hot climates, where the «Stoke hole» of a steamer is a very trying place, for one man is sufficient to look after half a dozen boilers, and then he has little or nothing to do but to watch and see that all is right.

Little alteration is required to adopt a marine boiler to burn Petroleum beyond removing the firebars, and building an open fire brick wall at the far end of the flue to prevent cold air from «starting» the tubes when the firing is stopped; of course the necessary storage tanks and the small elevated tanks for feeding the burners, as well as the burner, and a few small cocks and pipes are required, but a steamer so adopted only requires the firebars to be replaced to make her ready for burning coal.

The cornish or Lancashire type of boiler is a most suitable one for the burning of Petroleum, for little alteration is required but the removing of the fire-bars.

I do not consider the present form of fire-box of a locomotive boiler at all the most suitable one for burning Petroleum, and no doubt a cheaper and more suitable form will be designed and adopted in places where reliance can be placed on the continuous supply of Petroleum.

In boilers of condensing engines, or engines whose fires are not effected by the «blast» or waste steam, the proportion of air, oil, and steam can be easily regulated to cause complete combustion, and little or no further alteration is required, but in the case of a locomotive or high pressure type whose fires are regulated by the «blast» or waste steam, which in a locomotive is ever varying according to the incline or wind etc. and therefore drawing more or less air through the fire in proportion to the strength of the blast,

it is necessary to be frequently regulating, the quantity of Petroleum and Steam in proportion to the blast, in order to obtain complete combustion with economy, but I have no doubt the three can be automatically worked, which will remove (as at present) the Control of the consumption from the driver and fireman.

With the Locomotive fire box (as at present) the burner has to be so arranged as to give a flame (in shape) suitable to the shape of the box, and where the flame strikes, it is necessary to protect the plates by fire bricks; the form and position of burner, I would recommend adopting, in the first instance, would strike the flame towards the bottom of the box, in which case the only modification necessary would be to replace the fire-bars by a plate lined with fire bricks up to the level of the foundation ring, for in case a burner is used, very similar in construction to an ordinary injector, it would be then necessary to add much larger amount of fire bricks and differently arranged, and although I am off opinion that a large mass of heated fire bricks must greatly assist towards obtaining a complete combustion of the gases, still as I have not seen such a type of burner in use on the railway that runs from Baku to Batoum, I would recommend that experimenting be allowed to stand over until after the main object has been obtained: viz, the practical adoption of Petroleum as a fuel to our Locomotives.

In the case of a Locomotive, many slight additions are required besides the burner and the fire bricks to protect the plates, such as a few small cocks, pipes, and connections, also an oil tank with a capacity of about 3 tons is required to be placed over the Tender, and the blast will require «easing» but from all I could learn the repairs required to the fire-box and tubes are less since the introduction of Petroleum as fuel than formerly with coal, and a day's work will be sufficient time to re-model the Locomotive for burning Coal.

When first lighting up a boiler with Petroleum, it is necessary to ^{Lighting up} use borrowed steam, or else the steam must be raised by wood etc. to a pressure that will spray the Petroleum before the steam in the boiler can fire its own boiler.

Of the many Patent burners I have seen, they are all the same in principle, the difference between them being the mechanical adjustment and shape of flame to suit the different applications. At present the greater portion off the line between Baku and Batoum is worked by Petroleum, and many steamers and shop appliances, and all with equal success.

Transport.

Kerosine is carried in bulk both in steamers, sailing vessels, and Railway tanks of 10 ton capacity, and also in casks and tin cases. Nobles have a line of about a dozen steamers running to the Volga, that carry it in bulk, and there are two other steamers that have been running in the Black Sea from Batoum to Odessa, and I hear one of them is about to make a trial trip from Batoum to London.

On Nobles' Steamers reaching the 9" feet at the mouth of the Volga, the oil is pumped into tank barges, and towed up the river, and it is then pumped into Storage tanks and carried over the Railways to their numerous dépôts, where the retail merchants bring their casks to be filled.

Nobles' Steamers are of iron with a carrying capacity of about 750 or 800 tons, and are divided into several compartments and every care is taken to guard against the liability of the movement of the oil in a rough sea; also it is of the greatest importance that the tanks are perfectly gas-tight.

The tanks terminate in an up-take pipe capped with a «Davy lamp» to allow of the free and safe escape of the gases.

In Nobles' Steamers, the engines are placed in the middle, and the front and aft end are fitted with water compartments, which are used as ballast in the return journey.

The portion of the steamer between the front water-tank and the engines is divided into nine compartments, with the top about 7 feet below the main deck, and in case any gases accumulate in this space between the top of the oil tank and the main deck through leakage, an Ejector is arranged to draw them off.

In Nobles' steamers, the sides of the steamer form the sides of the tanks, but it would probably be better to have the tank separate with

sufficient space between it and the sides of the steamer, to allow of a man passing between them, in order to detect leakage and do the necessary repairs without the steamer having to go into dry dock.

Between the engine and the aft part of the ship, Nobles have a round tank standing some height above the deck, and the portion directly under this tank, forms the receptacle for the fuel or Astalki, holding about 30 tons.

This Astalki is pumped into small elevated tanks placed either side of the boilers.

The double trip amounts to about 800 miles, and 5 koupecks a pood, or 6/- ton, will cover the cost of transport, including a fair return on the outlay on the steamer which cost about Lst. 20.000 ; whereas the Railway charge from Baku to Batoum, a distance of about 600 miles, cost 16 koupecks a pood, or nearly Lst. 1 a ton.

In my opinion, there is no doubt that the bulk transport is the right thing and will be the future transport, and with the exception of the steamer being run into, I do not see any more danger in the bulk system than the casks

At Baku and Batoum, casks are made and repaired. The new work is all done by the piece, and there are a few who can turn out seven a day. The tin cases are made at Batoum by American machinery, and also by the piece, and the Factory can turn out 6.000 a day, as well as make the wooden boxes to carry the pairs of tin cases.

SUMMARY OF REPORT.

The Baku Petroleum Industry was worked from 1801, to 1872 as a monopoly, and the production of Crude Oil increased from 150.000 poods (2.500 tons) in 1832 to 1.535.981 poods (25.600 tons) in 1872; in the year 1872, the monopoly was abolished, and an excise duty levied. and during this period, the increase of production was from 25.600 tons in 1872, to 250.000 tons in 1877. From September 1st 1877, the trade has been free from all taxes, and the increase has been from 250.000 tons in 1877 to 1.700.000 tons in 1885.

The property in which the wells are situated, is in the hands of many, and at present the proprietors are leasing out their lands to the sinkers for $\frac{1}{2}$ koupeck a pood, or 7 pence a ton, for all the oil raised, or another plan is for the proprietor to take $\frac{1}{3}$ of the oil raised.

The distilling is also in the hand of many, commencing in 1861 with 2 refineries and in 1885 there were 130. The export of Kerosine in 1865, amounted to 1.666 tons, and in the year 1885. - 450.000 tons.

Nobles' is the only continuous system, and his produce of Kerosine has increased from 120 tons in 1876 to 180.000 tons in 1885.

The transport is various, but the large proportion of what goes into Russia is carried to the Volga by steamers and sailing vessels in bulk; On the Black Sea there are but two steamers at present that carry it in bulk but this is owing to the difficulty in getting the Kerosine in sufficiently large quantities over the Railway from Baku to Batoum.

As a fuel, it is the only one used for working the engines at the wells, and for the raising of steam, and the other numerous requirements at the Distilling Factories; also the steamers on the Caspian, and the greater part of the Railway from Baku to Batoum is worked by it.

A few remarks Applicable to laying out of new Works.

The works for distilling and purifying should be as near the wells as practicable.

A good supply of sweet water is most necessary, for besides the requirements of the workmen and their families, a very large quantity of steam is used in the process of distilling and purifying, and therefore this, together with cheap food, good transport, and accommodation for workmen, and nearness to a port where there is every facility of turning the many products to account, are some of the important points to consider in settling on the position for the distilling and purifying works.

With a fair prospect of a large supply of Crude Oil, there is no doubt that the continuous system of distillation is the one to be adopted, supposing the oil is not too thick to flow by gravitation through the «stills».

In planning out new works the first plan should embrace a Factory sufficiently large and complete to turn out a very much larger quantity of Kerosine than may be expected for the first few years, so that, as the increase of production of Crude Oil calls for additional tanks, stills, purifiers, engines, pumps etc, the proper place is ready to receive the several parts, so that the works gradually grow until your first plan is executed, and so the result is a compact Factory.

Every attention should be given, in the first place, to lessen the number of forms and sizes of cocks, valves, pipes, connections, engines, pumps etc., and more especially with the Distilling works, for the stores must contain duplicates of all fittings connected with the distilling, so as to be able to replace any damaged portion with the least possible delay. The same system should be carried out, as far as practicable, with the machinery at the wells.

The question of whether the rope or rod system of drilling should be adopted, depends much upon which system the drillers have been accustomed to. Both systems require the same plant, such as engine, crabs, working beam, derrick, etc. The only essential difference being the rod; in the one case is substituted by the rope in the other, and as the rod is much more lasting than the rope, difference in cost is immaterial.

As regards transport; there is no doubt that the future transport is in bulk carried by steamers, sailing vessels, or Railway tanks, for although a steamer or sailing vessel so adopted cannot carry much freight on the return journey, the empty casks have to be returned and take the same space as when full, and the loss in pace in transport in casks is very great, compared with the bulk transport, and again there is much cost incurred in the repairs and renewing to keep good the stock of casks.

The only argument I see in favour of tin cases, is that for transport over countries that necessitate the material being carried on horse-back, but this is more a matter for the retail merchant than producer.

As a fuel, it has very great advantages over coal or wood, and where it can be obtained at about the same cost, it surely will be the future fuel, and more especially so in the case of steamers, for one man is sufficient to attend to have a dozen boilers.

(Signed) : F. H. TREVITHICK,
Loco. Carriage and Wagon Supt. Egyptian Governmt. Railway.

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